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Climate change and environmental degradation and the drivers of migration in the context of shrinking cities: A case study of Khuzestan province, Iran

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ABSTRACT

The desire to improve the quality of life and to avoid environmental degradation has prompted human beings to migrate across the world over time. Through a survey regarding the contribution of different drivers on migration out of the shrinking cities of Khuzestan province, the study shows that climate changes and environmental degradation have a considerable influence on out-migration. Overall, these environmental factors exert both direct and indirect effects. The former, which is proven through a quantitative analysis, implies that the climate and environmental changes are so influential that they have compromised the human habitability in this area of the Middle East. Therefore, having reached the risk threshold, people are increasingly persuaded to leave the shrinking cities. Besides, the extent to which environmental changes contribute to the intensification of the economic downturn, unemployment, addiction, corruption, violence, crimes, and the disruption in the urban infrastructures in this region, underscores the importance of the indirect effects of climate and environment changes in migration from the shrinking cities of Khuzestan province.

1. Introduction

While urban growth, mainly as a consequence of in-migration, has been a frequent topic of discussion, some debates have recently been made over the places losing a significant share of their population, identified as shrinking cities (Haase, Bernt, Grossmann, Mykhnenko, & Rink, 2013; Hollander, 2010). So far, a variety of definitions of urban shrinkage have been proposed, but, among them, one common element is population decline (Haase et al., 2013). As shown in Fig. 1, population decline is mainly a result of two processes, namely population migration and the prevalence of deaths over births (Hospers & Reverda, 2015). The latter process may be formed in two ways; first, shifts in the age distribution of a population toward older ages or population aging and, second, annihilation of population due to natural or man-made hazards such as wars, earthquakes, floods, fires and epidemic diseases (Bernt, 2009; Van Ham & Ubarevičienė, 2014). However, recent empirical evidence shows that a large number of shrinking cities lose their population due to migration (Couch & Cocks, 2013; Haase, Rink, & Grossmann, 2016; Un-Habitat, 2008; Wiechmann, 2007). In this respect, Bernt (2009) identifies migration, along with mortality and fertility, as the main factor affecting the decline of cities.

Researchers have so far identified many factors as the drivers of urban shrinkage. However, since the literature on the shrinking cities mainly focuses on such countries as the United States, Germany, and the United Kingdom (Haase et al., 2013; Schetke & Haase, 2008; Wiechmann, 2008), the focus has predominantly been on economic factors (Bernt et al., 2014; Couch & Cocks, 2013; Hartt, 2016; Hollander, 2010), spatial development such as suburbanization (Bernt et al., 2014; Van den Berg, Drewett, Klaasen, Rossi, & Vijverberg, 1982), demographic changes (Haase et al., 2016; Sekeliling et al., 2010), and global crises (Cunningham-Sabot & Fol, 2009; Martinez-Fernandez, Audirac, Fol, & Cunningham-Sabot, 2012). To clarify, the common perception is that a shrinking city is where major factories and industries are shut down due to economic changes caused by globalization, increased productivity, and lose their attractiveness for investment (Van Ham & Ubarevičienė, 2014), or where the population has aged and declined because of increased life expectancy and declined fertility (Van Ham & Ubarevičienė, 2014; Sekeliling et al., 2010).

Nevertheless, as recent studies have highlighted the role of climate and environmental changes as a key factor in massive population displacement (Piguet, 2010; Warner, Hamza, Oliver-Smith, Renaud, & Julca, 2010), it seems that these environmental issues can pose considerable challenges to shrinking cities and lead to a vast population migration out. Therefore, significant contributions to the development

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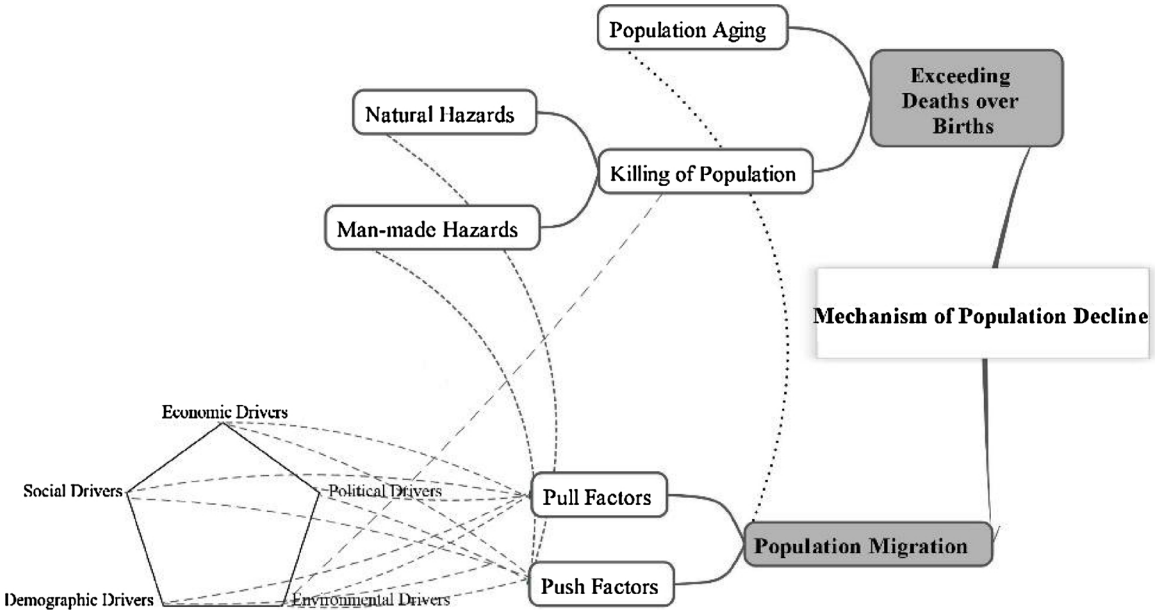

Fig. 1. Mechanism of population decline, Source: authors.

of shrinking cities studies can be made by developing a deeper understanding of the effect of climate and environmental changes in out-migrating from shrinking cities. The present study, accordingly, seeks to examine the impact of climate and environmental changes in association with other drivers on out-migrating from the shrinking cities of Khuzestan province, Iran, which is a region confronted simultaneously with a socio-economic decline and environmental degradation.

Khuzestan province is a strategic and oil-rich region in the southwest of Iran. Since the beginning of oil drilling there (i.e., about 1908), it has entered a new phase of urbanization. After about a century, the development of industrial and extractive activities has strongly affected the environment of the region. Nowadays, some cities in the region are shrinking. What has happened as urban shrinkage can be considered as a particular type of shrinkage in the context of a developing country with rapid urbanization where climate and environmental changes have posed many challenges to the shrinking cities, leading to a considerable population migration out (Fanni, Khakpour, & Heydari, 2014; Roshan & Nastos, 2018). Since migration is a complex phenomenon and is generated by a combination of factors, this paper focuses on how environmental and climate changes, among other drivers of migration, contribute to out-migration from the shrinking cities of Khuzestan province. It begins by outlining the drivers that affect out-migrations. Then, the role of climate and environmental changes in decisions for migration from these cities is examined.

2. Study of environment-induced migration

2.1. Globally

Nowadays, a large number of countries, ranging from developing countries like Bangladesh to developed countries like the Netherlands, are facing environment-induced migration (Neumann et al., 2015; Seto, 2011). Myers, as the most frequently cited though controversial estimate figure[1], estimated the number of recent environmental-climatic migrants to be about 50 million people (Myers, 1993, 2002, 2005).

Mcleman and Gemenne (2018) while highlighting the fact that no country or place in the world is entirely safe from the impacts of global environmental changes, note that some regions are more susceptible to the impacts than others. In explaining this susceptibility, they refer to some significant reasons such as asymmetry of power in societies and structures in the economy, institutional and behavioral phenomena, and the ability to respond to external stresses. It appears evident, in a built-up area, that the residents respond to climate and environment changes in the form of either leaving the environment and migrating or remaining and adapting (Marchiori & Schumacher, 2011). Some perceive this type of migration as a failure for in-situ adaptation, while some others consider it as a rational component of creative adaptation (Bardsley & Hugo, 2010; McLeman & Hunter, 2010; Neumann et al., 2015).

Adger, de Campos, and Mortreux (2018) believe that the impacts of climate and environmental changes on migration trends are both direct and indirect. In fact, environmental changes affect migration patterns indirectly by altering the landscape of economic drivers and options for individuals in both source and destination areas, and directly by increasing the risks that a community faces. In relation to the direct impacts, it is argued that climate and environmental changes, in many cases, endanger human security and health (Lei, Finlayson, Thwaites, & Shi, 2013), and, when people reach a certain threshold, they migrate out for their survival (Bardsley & Hugo, 2010).

Terminski (2012) enumerates three causes for environmentally induced migrations including climate change and natural disasters, land and resource degradation, and long-term environmental disruptions by infrastructures development. Among these factors, during the past decade, climate change has been of the most significant effect on the life of human communities and it is anticipated that this trend will gain even more importance (Bardsley & Hugo, 2010; Black, Bennett, Thomas, & Beddington, 2011; Koubi, Spilker, Schaffer, & Bernauer, 2012). McLeman and Hunter (2010) also classify environmental events which lead to migration into two groups. The first is sudden-onset events such as tornados, hurricanes, floods, fires, heavy wind, rain, and snow, and the second includes slow-onset changes in environmental conditions such as drought, land degradation, or fluctuation in rainfall patterns (p. 451). In this regard, Henry, Schoumaker, and Beauchemin (2004) point out that the more slow-acting processes, the more long-term migrations.

Generally, there is ample evidence suggesting that changes in the climate and environment are hardly the sole cause of out-migration; rather, they are a part of a constellation of factors triggering migration

[1] Due to using a very fuzzy methodology, there have been doubts about Myers's predictions regarding the worldwide environmental displacements (Gemenne, 2011).

mainly in interaction with the society (Lei et al., 2013; McLeman & Smit, 2006; Neumann et al., 2015; Oliver-Smith, 2006; Warner et al., 2010). Mortreux and Barnett (2009) suggest that "for most people, climate change is not a reason for concern, let alone a reason to migrate, and that would-be migrants do not cite climate change as a reason to leave" (p. 105). Similarly, Findley (1994) and Henry et al. (2004) showed that, in Burkina Faso and Mali in the 1970s and the 1980s, drought was associated with a decrease in international long-distance migration on the one hand and an increase in short-distance migration to larger agglomerations during dry years on the other hand (Black, Kniveton, & Schmidt-Verkerk, 2013).

Moreover, all population groups not only are not equally affected by climate and environment changes but also their capability to leave the environment is not the same. Adger et al. (2018) point out that social groups which are highly vulnerable also have low adaptive capacity are exactly those that have the fewest pathways and resources to allow them to leave and decrease their vulnerability. Evidence from the Gulf States in the US over the past three decades in the context of migration from hurricanes by Logan, Issar, and Xu (2016), for example, showed that affluent groups had left, while exposed populations had not had the resources to move.

2.2. Regionally

Empirical evidence shows that the Middle East is one of the regions strongly affected by climate and environmental changes. As mentioned by Klingmüller, Pozzer, Metzger, Stenchikov, and Lelieveld (2016), drought, heat waves, and dust storm have become common in most parts of the Middle East.

Although the human consequences of climate change have not received sufficient attention in this region, they are becoming more serious. (Brown & Crawford, 2009; Gleick, 1994; Sowers, Vengosh, & Weinthal, 2011). In this respect, although the claim that 'climate change-related drought helped fuel the early unrest in Syria, which descended into civil war' (Obama, 2015) has become more and more suspect (Selby, Dahi, Fröhlich, & Hulme, 2017), a number of studies underscore the notion that the recent civil wars in the Middle East have many roots, one of which is worsening environmental conditions (Gleick, 2014). They believe that the extreme drought experienced within Syria before its civil war played an important part in extensive mobility; and this mobility, in turn, increased the socio-economic tensions that underpinned Syria's descent into war. Furthermore, Rouchdy (2017) points out that the long-term social implications of climate and environment change on the United Arab Emirates (UAE) are in sectors including transportation, tourism, real estate, water, food, and energy, which could represent a threat to the UAE economy and national security.

In Iran, migration has been one of the most significant challenges in recent decades. In this respect, the role of climate and environment change is not negligible. Examples of this can be seen with regards to the earthquake and its role in population mobility. Some findings also refer to the role of drought in the large-scale internal migration from rural to urban areas in the last three decades. Moreover, a considerable amount of research (Keshavarz, Karami, & Vanclay, 2013; Motamed & Devisti, 2012; Rezaei, Gholifar, & Safa, 2016) has been directed to investigate the direct and indirect effects of recent droughts in Iran on migration from rural areas to cities. These studies share the view that the impacts of drought on migration trends are complex and emerge in various aspects.

Furthermore, many studies point to the rising temperature in Iran and the Middle East and notably warmer summers in recent years (Pal & Eltahir, 2015; Delju, Ceylan, Piguet, & Rebetez, 2013; Medany, 2008). Although the effect of hot heatwaves on migration in this area is not fully understood, Pal and Eltahir (2015) underscore that the upward trend in temperature is so alarming that it can eventually make the Persian Gulf countries virtually uninhabitable and could force people to migrate.

3. Drivers of migration

Migration is rising across the globe, and the drivers of this increase are manifold (Castles, 2013). Over the last two decades, a consensus has been reached on the forces which lead to the inception of migration and the perpetuation of movement (Van Hear, Bakewell, & Long, 2012). Taken together, these can be understood as the 'drivers' of migration. Generally, the complex phenomenon of migration cannot be understood just by focusing on a single cause; rather, it is necessary to cast a multidimensional look at the issue (Faist & Schade, 2013; McAuliffe, 2017). Considering the literature and the empirical evidence concerning migration, one can divide drivers of migration into several dimensions (Adler & Gielen, 2003; Black, Adger et al., 2011; Seto, 2011). These dimensions are delineated below.

3.1. Economic drivers

Economic drivers often play a central role in the majority of migration trends and have been a part of most migration theories (Lei et al., 2013; Rockwood & Tran, 2016). Although it is a prevalent idea that economic factors are a key driver of migration, some scholars such as Fei and Ranis (1964), Lewis (1979) and Todaro (1980) consider migration, in turn, as an essential factor in economic transformations. The approaches about the relationship between economic factors and migration have undergone many changes. Initially, it was assumed that migrants move from the poorest to the wealthiest regions particularly in international migrations (Tapinos, 1990; Van Hear et al., 2012), but some evidence, particularly in Africa, rejected the notion. So, migrations are not necessarily from the poorest to the wealthiest regions (Faist & Schade, 2013; Findley, 1994; Flahaux & Haas, 2016; Henry et al., 2004; United Nations Development Program, 2009). Generally, many economic factors have been enumerated in this regard, the most prominent of which include employment opportunities, income levels, cost of living, technological development, investment, market integration, and economic reforms (Neumann et al., 2015; Seto, 2011).

3.2. Social and demographic drivers

Social and demographic drivers make up another set of factors that affect migration decisions. According to 'push-pull' models (Harris & Todaro, 1970; Lee, 1966), there is a couple of interrelated motivations among migrants; avoidance and the desire to improve one's current status. To be more exact, some people migrate in order to avoid some social and demographical problems including cultural problems, insecurity, gender inequities, ethical problems, diseases, and negative events. On the other hand, some others migrate in order to improve their current status and make achievements in the destination (Black, Adger et al., 2011; Zahra, Ashraf, Zafar, & Yaseen, 2018). The motives include enjoying social services such as education, health, recreation and leisure facilities, freedom, marriage, and children's marriage. Besides these two groups of factors, however, there exist some factors to serve as mediators or catalysers such as social networks, family relationships, and language (Adserà, 2015).

3.3. Political drivers

Political drivers are considered as predisposing or approximating factors in migration trends particularly in developing countries. While, in Western contexts, the effect of the state on urban and regional development is limited to such activities as planning, construction of public transportation systems, provision of social services, and maintenance of public security, in some countries like China and Iran, the impact of government on urban and regional change is generally very strong (Liu, Yin, & Ma, 2012). In fact, some government activities and

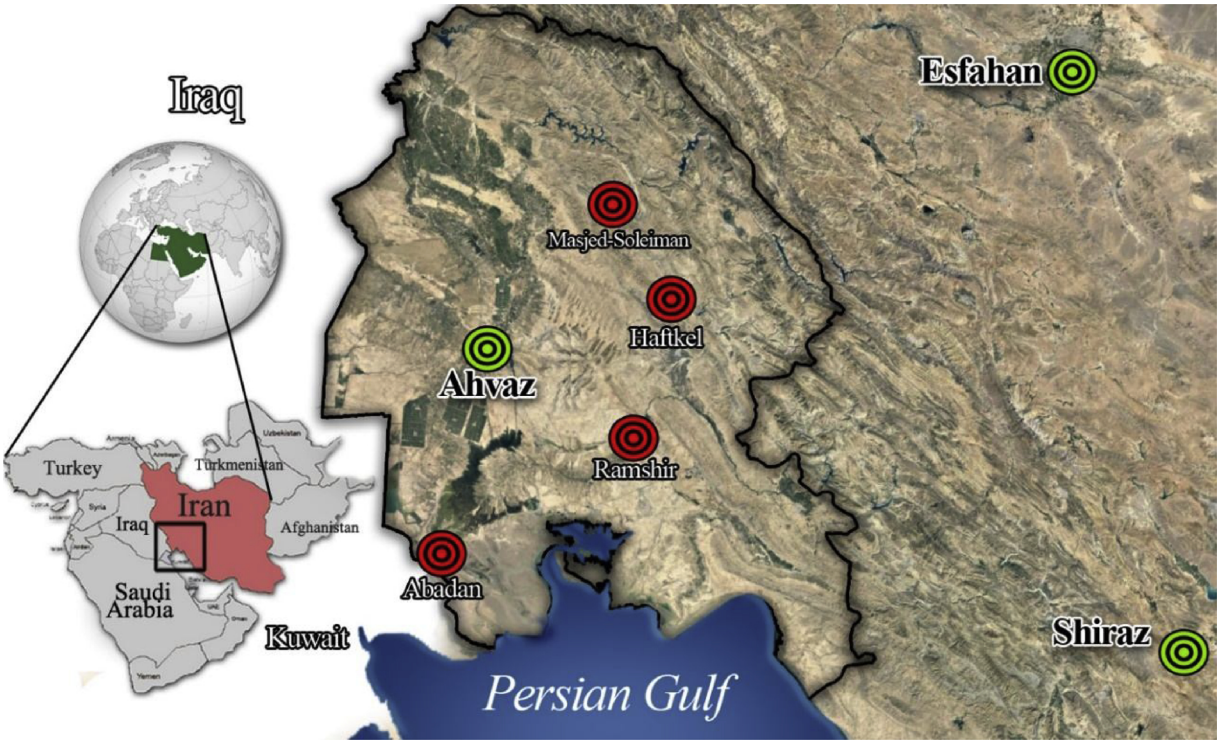

Fig. 2. Descriptive map of the shrinking cities of Khuzestan province prepared by authors using Google Satellite images as a base.

decisions such as regional, national and international policies and plans, discrimination, persecution, conflicts and wars, avoidance of investment, resettlement programs, and type of governance lead to the decline of some cities and regions, which intensifies the trend of migrations (Lei et al., 2013; Neumann et al., 2015; Seto, 2011).

4. Methodology

Focusing on four shrinking cities including Abadan, Ramshir, Haftkel and Masjed Soleiman in Southwestern Iran (see Fig. 2), the study aims at the role of environment and climate changes in decisions about relocation from shrinking cities with regard to such migration drivers as economic, social, physical-infrastructural, and political factors. The cities are the capital or administrative centers of counties (i.e., Shahrestān) and have a minimum population of 10,000, but they faced population losses during 2006–2011.

Since the use of any quantitative or qualitative method was inadequate for understanding and explaining the research problems and hypotheses, a mixed research method was used. In this regard, the drivers were first examined using a quantitative research method. The relationships between the variables were then examined in more details using a qualitative interview. Therefore, this study represents an exploratory mixed method design, as also used by Creswell (2013).

In the quantitative analyses, a questionnaire was developed to assess the impact of migration drivers derived from a literature review. As shown in Appendix 1 and 2, of the total 35 selected indicators, five discussed economic variables, seven discussed physical-infrastructure variables, four examined environmental-climatic changes, thirteen discussed sociocultural variables and six examined political/managerial variables. A Likert scale was used to measure the relevance of the indicators in relocation decisions of the respondents. Concerning the sample size and population, according to the census of the Statistical Center of Iran (SCI) from 2006 to 2011, the number of people who left the shrinking cities in Khuzestan province is about 26,117. The SCI statistics showed that 87% of the immigrants moved to Ahwaz City as well as the cities in the provinces of Isfahan, Tehran, Alborz, and Fars which were regarded as the target cities of the research. As Delken (2008) points out, studies of shrinking cities are often criticized for excluding people who have left those places and focusing on the perception of current inhabitants. To counter these limitations, the questionnaires were completed by both the residents of the shrinking cities and the emigrants moving to the target cities.

Based on the Cochran method (1977), The sample size was calculated to be 319. A random method was used for sampling in the shrinking cities. In the target cities, however, where the exact location and information of the migrants were not known to the authors, Respondent Driven Sampling (RDS) as a subset of snowball sampling was used (Heckathorn, 1997). It can be described in several stages. The first step was enlisting some immigrants to find seeds (the first-wave respondents). After finishing the survey of initial respondents, they introduced other qualified interviewees for us, who would subsequently introduce new eligible respondents after finishing their questionnaires. Following this, the statistical population increased like a rolling snowball.

For the data analyses, the Structural Equation Modeling (SEM) was used to evaluate the impact of the drivers regarding each aspect. In justification of using the SEM, it is to be suggested that, over the past 30 years, the SEM has been widely recognized as a mature method of analysis in advanced theoretical models. This method, in addition to ease of use, provides researchers with more flexibility to model and test sophisticated theoretical relationships. Also, great credit is given to the SEM for the validity and reliability of the scores obtained from measurement instruments (Schumacker & Lomax, 2010).

To gain a better insight into the interplay of drivers and motivations, in-depth interviews were used to collect primary data for the qualitative analysis. Besides, the researcher's perceptions gained through direct observation and local social media supported the qualitative analysis. The interviews were conducted within fifty days in November and December 2015. In total, 52 in-depth semi-structured interviews were conducted, half of which were conducted with the residents of the shrinking cities and the other half with the former residents of the target cities. Random and snowball sampling methods

were used in the shrinking and the target cities respectively. In total, 69% of the interviewees were male, and 31% were female. The lower number of the female participants in these interviews was due to their reluctance to cooperate. The reluctance is primarily rooted in specific cultural and religious restrictions on women's communication with men. Attempts were also made to include those who had above average knowledge about outmigration from Khuzestan's cities and its causes. These people included prominent community members, social network activists, experts, seniors and social workers. Moreover, some interviews were conducted with stakeholders in urban development including government employees, officials, shopkeepers, students and youth, and retirees.

In each interview with the out-migrants, they were asked to provide reasons for their migration. Also, the residents of the shrinking cities who had not emigrated until then were first asked if they had any interest in migrating from their cities, and to express their reasons. A list of questions was prepared in advance to contribute to the interview process. These questions were derived from the questionnaire used in the quantitative analyses, which were used in the interview process, especially when some aspects and drivers had not been discussed. This was done because the purpose of the qualitative analyses and interviewing was to explain the extent of the impact of drivers and, in general, the results of the quantitative analyses. As Mortreux and Barnett (Mortreux & Barnett, 2009) suggest, it is critical that respondents be in no way prompted by the interviewer to cite climate and environment change as a reason for their migration decisions. Therefore, specific questions about climate change were not asked until the end of the interview.

Finally, because of the wide range of data obtained from the in-depth interviews, existence of multiple variables, and importance of making organized connections between them, the qualitative data analysis software of NVivo was chosen. Since the qualitative analyses in this research were supported by a general theoretical background, a deductive strategy was used in the software environment to analyze the interviews. Based on the theoretical foundations and the research background, the nodes and sub-nodes were generated and divided into five economic, social, physical-infrastructural, environmental-climatic change, and political aspects. Subsequently, the interviews were transcribed in the software environment and, if necessary, new sub-nodes were generated. Afterward, the terms and statements in the interviews were coded based on the generated nodes and sub-nodes. Finally, the analyses were performed based on the divisions and codings.

5. Study area

Khuzestan province (Fig. 2) is a plain and a relatively flat region located alongside the mountainous regions in the southwest of Iran, lying at the head of the Persian Gulf, and bordering Iraq in the west. The province is notable for its oil resources (Britannica, 2016). It covers 64,055 km^2 with an elevation range from 0_m in the southern port areas to 3000 m in the western mountainous regions. The plain part of the province covers about 60 per cent of the area, and it contains a large part of the urban areas and population of the province. Temperature evaluation indicators show the region is located in a desert hot climate zone. Generally, the temperature is very high in most months of the year, and most meteorology stations have recorded a maximum temperature of 50 °C in summer. The temporal distribution of rainfall also indicates a low number of rainy days in the region. The average annual rainfall is about 150 mm, and the effective rainfall occurs mainly during the winter months, but there is no precipitation in summer.

Generally, changes in the climate and environment have posed significant challenges to the province authorities over the past years (Fig. 3). Dust storms, rising temperature in summer and exhausting heat, microbial rains, droughts, and floods are the most critical problems that Khuzestan province has been faced with (Keramat, Marivani, & Samsami, 2011). According to Goudarzi, Geravandi, Vosoughi, Javad Mohammadi, and Sadat Taghavirad (2014), Ahwaz, the provincial capital, is one of the most polluted cities in Iran. They have also found that pollution in the region is due to the high fuel consumption of vehicles, oil industry, as well as steel and other heavy industries. Climatic fluctuation on one hand and proximity with countries such as Iraq, Saudi Arabia, and Kuwait, which have vast empty deserts, on the other hand, play significant roles in the intensification of desertification and creation of dust storms. The sharp decline of precipitation and severe droughts combined with the destruction of palm groves in southern Iraq have caused air instability leading to dust storms (Boloorani & Moshayedi, 2014; Gohardoust & Teymori, 2011).

The statistics obtained from the Iranian Meteorological Organization show that there has been an average of 85 dusty days in the shrinking city of Abadan over the past years. Also, the number of pulmonary patients in medical centres has risen to 70 per cent during dusty days. In addition to health problems, the climatic challenges have had a negative influence on agriculture, education (e.g., school shutdowns), and airports (e.g., flight cancellations) (Maleki & Mavadat, 2013; Mobarak Hasan, Ghafarian, & Olad, 2014).

6. Research findings

6.1. Quantitative analysis

The analysis presented in this section are based on the proposed research model described in the Appendix 1. Accordingly, it was possible to quantitatively measure the impact of each of these drivers by designing a questionnaire. Economic, physical-infrastructure, climate and environment change, social, and political variables were considered as independent variables, and the migration decision was considered as the dependent variable. After a structural equation was formulated and questionnaires were designed (see Appendix 3) and completed (see Appendix 2), the effectiveness of each of the variables was determined. The model fit analysis showed that the model was at the standard level. In this regard, the chi-square minimum (CMIN) was 3.11, which implied the desirability of the model, as the value up to 5 is regarded as optimal. Moreover, the CFI, TLI rho2, and IFI Delta-2 indices were acceptable since they were at a level above the standard level of 0.90. Finally, the RMSEA value was found to be 0.076, which was acceptable as it was below the standard level of 0.08.

Table 1 shows the results of the structural equation model analysis. Economic, physical-infrastructural, environment and climate change, social and political drivers were considered as dependent variables, while the migration decision was considered as an independent variable. P-value represents the significance of data correlation against the "null hypothesis" of no relationship between dependent and independent variables. Estimate ranges from -1 to $+1$, with the sign indicating a positive or negative relationship. According to the Table, there is a significant positive correlation between the economic drivers and the migration decision as the P-value is less than 0.05 and the estimate value is positive. In relation to the physical-infrastructure drivers, the P-value is less than 0.05, and the estimate value is positive. As a result, the physical-infrastructure drivers also have a significant positive correlation with the migration decision. Climate and environment change drivers, i.e., the focused drivers of the research, also have a significant positive correlation with the migration decision because the P-value is below 0.05 and the estimate value is positive. The P-value and the estimate value in the social drivers suggest a significant positive correlation between these drivers and the migration decision. Furthermore, the P-value between the political drivers and the migration decision is below 0.05, and the estimate has a positive value. This suggests that the political drivers, like the other drivers, have a significant positive correlation with the migration decision. Finally, the β values in Table 1 show the rates of direct impact of individual drivers involved in the study on the migration decision. The impact of these drivers is in the range of 0.86 to 1.04. Accordingly, followed by the political drivers

Fig. 3. Dust storms and floods in the cities of Khuzestan province.

Table 1
Results of the structural equation model analysis.

β	Estimate	P	Index	Direction[a]	Index
0.86	0/249	0/032	Migration decision	→	Economic
0.91	0/364	0/041	Migration decision	→	Physical-infrastructural
0.97	0/518	0/000	Migration decision	→	Environment and climate change
0.98	0/798	0/000	Migration decision	→	Social
1.04	0/485	0/000	Migration decision	→	Political

[a] The direction of the relationship.

with a β value of 1.04, the social drivers with a β value of 0.98 have the greatest impact on the migration decision. The climate and environment change drivers with a β value of 0.97, the physical-infrastructure with the β value of 0.91, and the economic drivers with the β value of 0.86 are the next drivers that influence decisions for migration from the shrinking cities of Khuzestan province.

Regarding the information in Table 1, it can be concluded that there is a significant regression path for all the variables of the research. In other words, due to the significant level of the P-values and the positive value of the estimates, all the physical-infrastructural, climate and environment change, social, and political drivers have exerted an influence on decisions for relocation from the shrinking cities. Also, the values of β reveal that political drivers and then social drivers and climate and environment change with the close values have the most impact on decisions for out-migration from the shrinking cities of Khuzestan province.

However, as mentioned in the literature review, migration is a phenomenon with multiple causes, which each driver not only directly but also indirectly influences migration processes through interactions with other drivers. Therefore, considering the interactions between drivers can provide a deeper understanding of the nature of migration in a society. Accordingly, the analyses presented in Section 6.2 try to give a clear overview of the interactions that exist between the drivers of migration in the shrinking cities of Khuzestan province.

6.2. Qualitative analysis

The findings from the conducted interviews can provide a deeper understanding of the variables and drivers of migration from Khuzestan province. Overall, a majority of the interviewees referred to some variables as important motivations for migration. The variables included unemployment, harsh weather conditions, inadequate facilities and infrastructures, limited government attention, and disappointment with the improvement of the conditions in the future.

Furthermore, through the interviews, new drivers and factors were revealed as motivators for out-migration, which were seldom suggested in previous studies. For example, while criticizing the dominant media space of the province and the country, some interviewees believed that dissemination of negative, frustrating, and alarming news through television, websites and social networks about the severity of the crisis in their cities was a catalyzing factor for their intolerance of the situation and their consequent decision for out-migration. In short, a vast majority of the interviewees addressed a set of variables, in a cause-and-effect relationship, as the main drivers of migration.

In relation to the nature of the population movements, despite suggestions to some seasonal migrations, the majority of migrants highlighted that their decision to migrate was not temporary and especially if the situation in Khuzestan continues, they will never come back. There are several reasons for this decision, including access to education and employment opportunities, marriage, and the higher quality of life. In connection with the inhabitants of the shrinking cities, although there was not a clear consensus among them on the reasons of their decision to stay, factors such as place attachment, relatives, and job satisfaction were more prominent. However, some of the inhabitants stated that despite the decision to leave the cities, they failed to migrate due to financial troubles. In other words, they were trapped in the cities.

6.2.1. Climate and environmental changes

Based on the conducted interviews as well as the authors' studies and observations, environmental events contributing to migration from shrinking cities of Khuzestan province can be divided into three categories of environmental crises, climate change, and climate. The most important environmental crises mostly addressed by the interviewees were dust storm and air pollution. Besides, the upward trend of temperature over the past few years along with drought to some extent, have been mentioned as the most important climate changes affecting migration. Harsh climate conditions, especially in summer, was also perceived as a climate factor influencing migration. As all of the environmental events were slow-onset, the decision-making process of migration occurred over a relatively long period of time. In this regard, an interviewee responded as follows:

> *"We have an environmental problem throughout the year. In summer, we must tolerate hot days of 40–50 degrees. When the weather becomes mild in winter, fine dust particles are suspended in the air. With this situation, the private sector is no longer interested in investing in our cities."*
>
> (Interview no. 35, December 16, 2015)

Some interviewees expressed that, along with the two old issues of unemployment and wreckage caused by the war with Iraq, nowadays, people have to deal with two new issues of dust storm throughout the year and extreme temperatures in summer. Moreover, some interviewees noted that, although they had been exposed to dust and heat in the past, they have seen a dramatic increase in these two phenomena over the past few years such that they have currently become one of the main concerns of the people and authorities.

As some interviewees expressed, climate change, such as increasing temperature, combined with environmental problems, such as dust storm and air pollution, have led to a threat to the residents' health, which has, in turn, led to their migration. In fact, a large part of the population has reached a risk threshold, and they have adopted migration as a strategy in response to the changes. Therefore, as noted by some respondents, many doctors mostly recommend those who are at greater risks to leave the province. In this regard, some participants

pointed out that the number of visits to the hospitals would be multiplied at the time of occurrence of this phenomenon. Note the following statement:

"I had to go to the city hospital for a few days after the accident of one of my family members. One day, when it became dusty, the hospital got so crowded that I was so terrified and recalled the days of war and field hospitals at that time. Apart from the large volume of dust inside the building, the hospital was so crowded that the rooms were filled up, and many were lying on the chairs. The hospital staff did not know which patients should be treated."

(Interview no. 45, 4 November 2015)

According to the interviews, those who migrate due to the combined effects of climate and environmental changes can be divided into two groups, the retired and elderly and the elite[2] . If young people mainly consider their migration due to unemployment, retired and seniors migrate to avoid Khuzestan's hot summer temperatures and winter dust storms. Of course, older people emphasised that the role of their children's unemployment or matters such as marriage decisions should not be ignored. As for the elite, they noted that during the past years, their life quality has declined due to environmental and climate changes, and they have had no other choice than leaving their cities. The point is evident in the following extract:

"I don't not know exactly how many, but the number of those who want to migrate goes up day by day. The worrying part is the migration of educated people, elites and specialists. So, the issue of migration is now more common among teachers, employees and the elite."

(Interview no. 5, 16 November 2015)

Some interviewees pointed to indirect effects of climate and environmental changes on migration trends. In fact, the increasing incidence of extreme weather events, such as record-setting heatwaves, droughts, and dust storm have exerted considerable impacts on the other dimensions. One example of the impact can be seen on the economic dimension, where some interviewees mentioned that the climate and environmental changes have led to the migration of retired, professional, well educated, and wealthy people, which in turn has intensified the downturn of markets in the shrinking cities. Interviewees, as another example, highlighted that with the increase of dusty days in these cities, the market is sometimes closed for several days a week, as people should stay home to keep healthy when dust storms occur. They also added that as the temperature rises in the summer, people go to the streets only for a few hours near midnight, which means stores are half-closed for long hours a day. Moreover, many people mentioned to compulsory summer trips to stay away from such hot weather. Similarly, as several survey respondents suggested, in few cases some family members like mothers and children go to other cities for a while to visit their relatives. Therefore, all of these factors lead to the emptying of cities and greater stagnation of markets. The following quotation is quite suggestive:

"Due to the heat, the employees' working hours are from very early in the morning until noon. Because of this, practically not many customers come to our café in the early hours of the morning. At noon, the weather is so hot that no one is in the streets until 21 o'clock when the heat is reduced. That is, most stores only sell from 21 to 24. After the midnight, except for grocery and food stores, the rest should shut down. With this in mind, not enough money is earned to pay the rent, laborers' wages and electricity, let alone gaining profit."

(Interview no. 52, 14 November 2015)

Some participants suggested that during daytime and with the rise of temperature, the traffic is minimized in the city, and urban transport-related businesses go to stagnancy. Another consequence of high temperature was stagnant construction activities in the summer. In some ways, construction businessmen face seasonal unemployment. Here is a statement in this regard:

"Since some construction activities such as welding cannot be done at high temperature and, as the workforce has low working efficiency during the heat, we do not give workers free money. We shut down the projects for 20 days to one month and start again when the weather is fine."

(Interview no. 35, December 16, 2015)

Accordingly, a link can be made between unemployment and environmental migration because climatic factors such as heat and its increasing trend and environmental factors, such as dust storm have contributed to the economic downturn and unemployment.

Climate change and environmental changes have also affected the social factors. According to the conducted interviews, with the increase of dusty days, the quality of educational and health services has decreased. Many of the interviewees pointed out that, during the school year, schools are closed for many days due to dust storms. In addition, many city officials have pointed out that, in recent years, a large number of experienced teachers have either migrated or requested to transfer to other cities to escape the heat of the summer and dust storms and this has led parents to worry about the future of their children. Note that this is also true for the healthcare sector. According to officials, physicians, particularly specialist physicians, are among those who are migrating from these cities. Moreover, it was noted that dust, air pollution and severe summer heat phenomena have led to an increase in the number of patients, especially respiratory patients, which has made it difficult to provide any services to them.

Some of the interviewees mentioned different points regarding the correlation between the increase of temperature over recent years and the increase of family problems such as betrayal, corruption and addiction. They pointed out that, with an increase in the heat, mothers along with their children in some families and especially young couples go to other cities of Iran for one or several months. They also added that in some cases, this has led to the betrayal, addiction or corruption of the father of the family, who needs to stay in the city for his job. In addition, with regard to the adverse impact of climate change and environmental crises on the rate of crimes, some interviewees referred to psychological effects. In fact, they believed that the increase in the number of days that people have to stay in their homes due to heat and dust had exacerbated depression. According to the interviewees, increased summer heat and adverse environmental conditions due to dust have led to heightened aggression and anger, which is the basis for crimes and social anomalies. Notice what one of the participants said:

"Khuzestan's climate has caused many physical and emotional problems for people, which may not be seen in cold regions. The heat in the province has caused citizens to have lower tolerance and show anger and aggression, which makes the ground for commitment of crimes. The majority of the citizens in Khuzestan have lost the desire to live in their hometowns and the affinity to their ancestral lands; they believe that Khuzestan is no longer a good place where to live."

(Interview no. 5, 7 December 2015)

Finally, the interviewees addressed the impact of the environmental crisis caused by dust storms on urban infrastructures, especially the electricity supply network. Some of the respondents noted that the electricity distribution and transmission systems are disturbed by intensified dust storms and mixtures of dust particles with rain-induced moisture. This often leads to electric power cut-off for some hours during the day, which causes life impairment and, ultimately, exacerbates public dissatisfaction.

Overall, although climate, climate change, and environment are overlapping drivers, there is a need to distinguish among them. According to Table 2, in all cases, two or more drivers exert

[2] By elite, we mean some people such as doctors, experienced teachers, specialists, skilled engineers.

Table 2
Direct and indirect impacts of climate change, climate, and environment on migration out of the shrinking cities of Khuzestan province.

Impact	Climate change	Climate	Environment	
	The upward trend in temperature	Hot weather	Air pollution	Dust storm
Health threat to the residents	*	*	*	*
Declining quality of life	*	*	*	*
The downturn of the market	*	*		*
Closing the market	*	*		*
Compulsory summer trips	*	*		
Stagnation of urban transport-related businesses	*	*		
Seasonal unemployment	*	*		
Decreasing the quality of education	*	*		*
Decreasing the quality of health services	*	*		*
Increase in the number of patients	*	*	*	*
Family problems	*	*		
Psychological effects	*	*		*
Crime and social anomaly	*	*		*
Disruption of infrastructure networks		*		*

simultaneously combined impact on the factors of migration. Meanwhile, while air pollution has a relatively modest impact, the role of climate and climate change are more remarkable. Besides, as some of the interviewees perceived the increasing trend of temperature and heat as a cause and effect, a similar pattern for both can be seen.

6.2.2. Economic drivers

In connection with economic drivers, the interviews showed that certain economic factors such as unemployment, employment discrimination, getting a better job, high cost of living, avoidance of local potentials, and decline of businesses affect population movements so significantly that they are considered as the main reasons for the migration of young people. According to those interviews, two groups of people out-migrate for economic reasons; first, unemployed people who are looking for a job in other cities and, second, employed people who are looking for better economic status. In fact, the second group expects a better future in other cities, especially in the capital and big cities.

Moreover, a significant proportion of the interviewees addressed the migration of retirees and elites of the province. Apart from the impact of such migrations on the population structure, many salespeople pointed to the market's recession. They explained that with the migration of middle and upper classes from the shrinking cities, the market in those cities is not as efficient as before. Regarding the issue of unemployment, many of the interviewees, especially the residents of and the migrants from Masjed Soleiman, considered it as the oldest challenge that would cause migration from the cities. This group of the interviewees claimed that they had not seen any changes in recent years despite the promises made by the authorities about the improvement of the cities. Moreover, the on-going unemployment was reported as one of the frustrating factors with regard to the future of the cities. This is evident from the following remark:

> *"I graduated from one of the best universities in Iran. I have already lost so much of my youth. However, not only is the problem of unemployment ignored in Khuzestan, but some other problems are being added to it."*
> (Interview no. 8, 11 November 2015)

6.2.3. Social drivers

Social problems and variables were other issues of interest to the interviewees. In general, they introduced a wide range of important social variables, such as low-level social services, poor health conditions, inadequate health care facilities, corruption, addiction, insecurity and cultural problems. Since several ethnic groups live together in Khuzestan province, some interviewees addressed discrimination, tension, and ethnic prejudices. Insecurity was also raised as another social problem of people, especially the people of the shrinking city of Ramshir. Some of the Interviewees argued that, during recent years, the level of insecurity had increased in their cities, and there was an increase in the number of armed robberies and ethnic killings. They also pointed to external variables, exacerbating insecurity in the cities. The Interviewees stated that vicinity of the province with Iraq, a country that was at war with Iran a few decades ago, has created a feeling of insecurity in border towns such as Abadan. Note the following quotation:

> *"Security is very limited in our city. Just a few days ago, in daylight, a few robbers armed with guns stormed into a jeweller's, looted the place, and fled after killing the shop owner. In general, the city is highly insecure, and tribal and ethnic murders occur much more than before. In such circumstances, is there any incentive to stay in a deprived city? What is the guarantee for our future?"*
> (Interview no. 46, December 10, 2015)

The increased rate of addiction[3] was expressed as another social problem affecting migration trends. In fact, some of the interviewees pointed out that many parents decided to migrate to prevent their children from becoming addicted in the future. Finally, the interviewees addressed a mediating variable. They speculated that forming a migration network and settling Khuzestan immigrants in several cities, especially those located in the centre of Iran, could enhance the migration process. This is evident from the following statement:

> *"Almost half the population of Shahin Shahr City consists of Khuzestan settlers who moved to the city after the imposed war. This is why Shahin Shahr is known as the city of Khuzestan retired people, who are often employees of the oil company."*
> (Interview no. 36, 20 November 2015)

6.2.4. Political drivers

Another important and influential migration factor is political drivers. This is particularly the case in developing countries because, in such countries, the state has a dominant role in people's everyday life (Liu et al., 2012). In Iran, the state, according to its rentier identity, has a significant contribution to the allocation of development budgets and oil revenues (Pourghadiri, 2012). It was shown through the interviews that political factors such as wrong policies, non-indigenous and/or under-experienced authorities, lack of the government's attention to the urban issues, ethnic discrimination, and change of policies have

[3] Addiction to illegal drugs such as opium, glass, and heroin are more prevalent in Iran than other parts of the Middle East (UNODC, 2018). Although addiction to these substances can be observed almost in all parts of Iran, Khuzestan is one of the provinces with the highest rate of addiction in the country.

drastically affected population movements.

Despite the highlighted role of Khuzestan province in oil production, many of the interviewees pointed to too little attention paid by the government to the cities. Another influential politics-related factor, which can serve as a research variable, is the migration of seniors and indigenous officials to big cities due to the declined life quality during past years. Based on interviews, the cities are managed by non-indigenous and under-experienced authorities. Also, some of the interviewees believe that unemployment is on the rise because of not utilising the local workforce. The following statement is suggestive of this point:

> *"The government sees the Khuzestan province only as a source of revenues and is less concerned with plans for development of its cities. I think the government simply neglects Khuzestan. Unfortunately, Khuzestan has been abandoned and seems to be under exploitation. All the resources including oil, gas, agriculture, and even the industry in this province are spent on construction in provinces other than Khuzestan province."*
> (Interview no. 15, 5 December 2015)

Moreover, when reconstructing the destructions of Iran-Iraq war, government attempts were unequally allocated to the cities, and more attention was paid to Ahvaz as the provincial capital (Pourahmad, 1994). As a result, some residents felt injustice and decided to migrate soon. Note the following quotation:

> *"A large part of infrastructures of our city were destroyed during the war. Unfortunately, the government did not rebuild them completely after the war. Now, we have many problems in our basic everyday needs, such as water and electricity, so much that it has disturbed our lives."*
>)Interview no. 30, 18 November 2015)

6.2.5. Physical-infrastructure drivers

With regard to the environmental-physical dimension, urban infrastructures, housing status, landscape, and environment quality were considered by some interviewees as important parameters. In this case, the interviewees believed that the environment quality of the cities had declined mainly because of the war a few decades ago. It was noted that one can still see the effects of the war on the cities that were involved in the conflicts. Indeed, after Iraqi air and missile attacks on the cities of Khuzestan province, especially the shrinking cities such as Abadan and Masjed Soleiman, many of the infrastructures were destroyed (Pourahmad, 1994). One interviewee claims that even three decades after the war, the damages from those years are still present. A good number of the interviewees stated that many basic facilities, such as quality water and electricity supplies, were not fully available to them, which had been constantly affecting their lives. Here is a representative piece of quotation:

> *"Our city (Masjed Soleiman) is called 'the city of the first'. About a hundred years ago, the first water treatment plant, railway, airport, hospital, swimming pool and soccer field in Iran, and even the first power plant in the Middle East, were built in our city. But now, the conditions of the city are such that water is often cut off and is generally accessible only for several hours at midnight. Besides, such inaccessibility to water lasts for a few days during rainy days due to infrastructure failures."*
> (Interview no. 28, 28 November 2015)

Finally, the respondents in this study compared the shrinking cities with growing ones such as Tehran, Esfahan, Shiraz and Ahvaz, which serve as the destinations of more than 50% of migrations, acknowledging the dramatic and widening gaps between them.

7. Discussion and conclusion

To reach a comprehensive and rigorous understanding of the role of climate and environmental changes in making decisions for out-migration from shrinking cities, the present study focused on this driver along with other drivers that affect the population drain. This approach was chosen for the study on the basis of the fact that climate and environmental changes cannot be considered as the sole variable affecting people's intention for migration. Instead, this variable constantly in combination with a set of economic, social and environmental variables influences the process of demographic mobility (Lei et al., 2013; McLeman & Smit, 2006; Neumann et al., 2015; Oliver-Smith, 2006; Warner et al., 2010).

Evidence from this research, as also provided in some previous studies, such as Lei et al. (2013), Neumann et al. (2015), Randell and VanWey (2014), and Seto (2011), showed that migration decisions may not be justified solely by one driver, but a wide range of influential drivers are at work.

In relation to the economic drivers, findings from this research were in line with the assumption that some population movements are associated with uneven economic development and, consequently, inequities in job opportunities and life quality (Couch & Cocks, 2013; Smith, 1990). The results were also in agreement with previous studies highlighting that loss of markets leads to a reduction in the financial capacity of shrinking cities and the escalation of their economic decline (Hospers & Reverda, 2015; Olsen, 2013). However, it emerged that the market downturn has not been solely due to the economic decline; instead, it has been affected by climate and environmental changes and political factors as well.

In relation to the social drivers, since studies of shrinking cities are mainly focused on Western countries (Martinez-Fernandez et al., 2016), some factors such as insecurity and ethnic tensions have been, so far, rarely discussed as effective social motivators of migration from shrinking cities. It may be argued that what has happened in the shrinking cities of Khuzestan province is almost comparable with the peripheral regions of some Middle Eastern countries such as Iraq (Sirkeci, 2005) and Turkey (Icduygu, Romano, & Sirkeci, 1999), where there is an environment of insecurity.

In relation to the political drivers, Hospers and Reverda (2015) pointed out that shrinking cities often cannot adapt to new economic developments, and they are restrained in outdated political-economic and social relationships. In fact, political changes in these areas lead to economic changes which, in turn, lead to the change of residential patterns and the migration of people from cities regarded as losers in the newly developed competitions (Haase et al., 2016; Pallagst, 2008). In line with the statement, in this study, it was made clear that Iran's revolution in 1979 and the eight-year war with Iraq during 1988–1989, as two major political events, have clearly changed all the political, economic, and social equations of Khuzestan province.

With regard to the physical and infrastructural aspects of shrinking cities, while previous studies have so far indicated surplus infrastructures due to population decline (Bernt et al., 2014; Hollander, Pallagst, Schwarz, Popper, & Hollander, 2009; Sekeliling et al., 2010), the analysis in this study showed that, due to the effects of war and the government's weakness in rebuilding the damaged areas after the war, the environment and the urban infrastructures are in bad conditions. As a result, in spite of the declining population, the shortages are still felt and convince a more significant portion of the population to out-migrate every day.

Regarding the impacts of climate and environmental changes on migration trends, the findings of this study revealed that the capability of all population groups to leave the environment is not the same. Accordingly, while some people, including elites and retired people, began to emigrate with a decline in quality of life, some other groups failed to emigrate. This finding is consistent with the results of Mcleman and Gemenne (2018) and Logan et al. (2016), which pointed out that social groups that are most vulnerable often have fewer opportunities for migration.

Like in many previous studies, such as Martinez-Fernandez and Wu (2007, 2009) and Martinez-Fernandez et al., the direct influence of

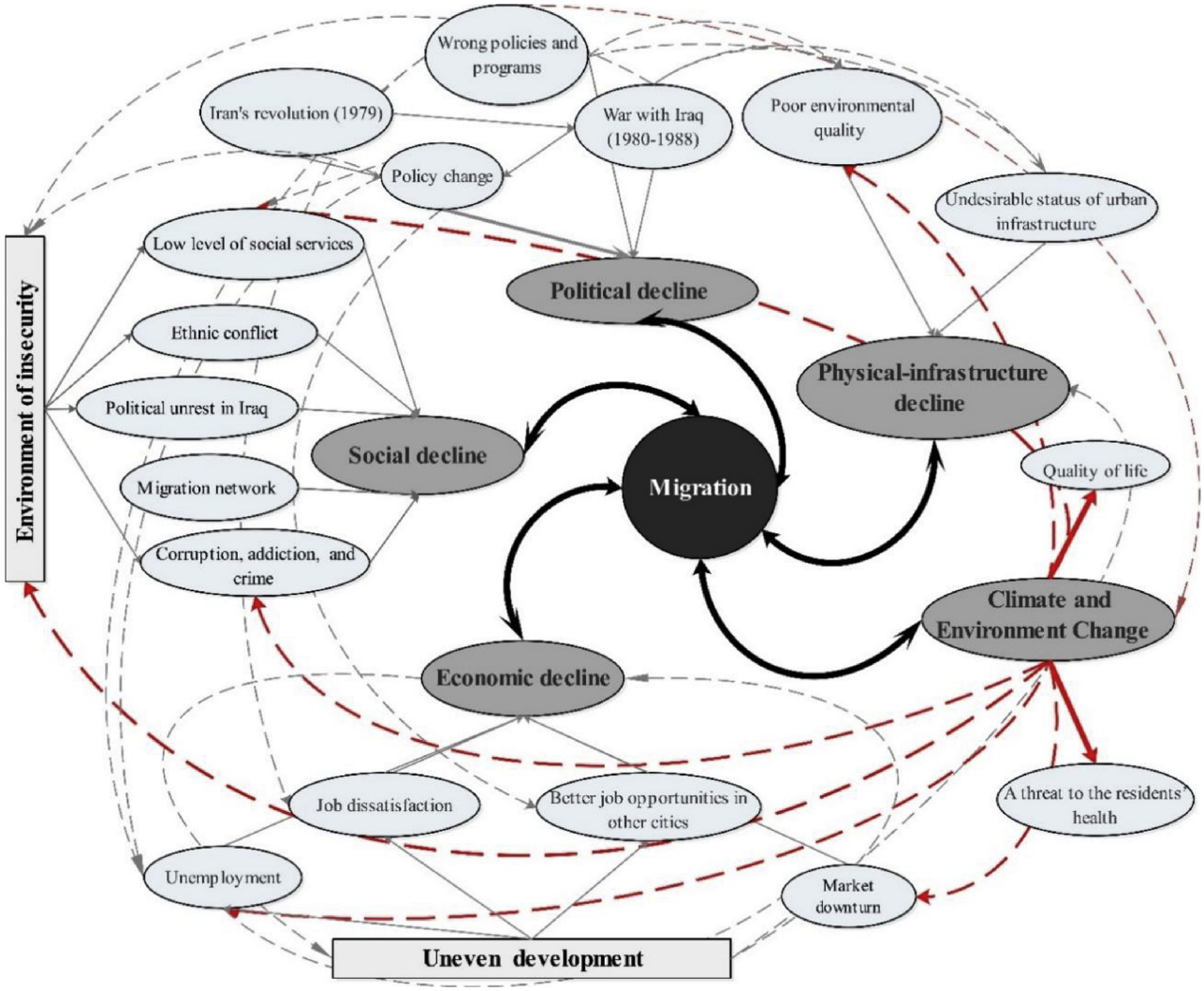

Fig. 4. Relationships among the drivers and factors that affect migration from the shrinking cities of Khuzestan province, Source: authors.

climate and environmental changes on migration was confirmed in the present study. The results showed that the climate and environmental changes were so effective as to reach a risk threshold and to pose a threat to the health of the inhabitants. In line with Pal and Eltahir (2015), the results of this study showed that climate and environment changes have compromised the human habitability of the region and have increasingly convinced more people to migrate.

In addition to the direct impacts on migration, the indirect impacts of climate and environmental changes on the other drivers of migration were a remarkable finding of this study. As mentioned by Adger et al. (2018), changes in the climate and the environment have been effective in the formation and escalation of many economic, social, physical and infrastructural problems. In relation to the linkage of these changes with economic factors, while a body of research has found that warming of the weather can positively affect certain living costs such as clothing, food, and traffic (Carmichael, Gallus, Temeyer, & Bryden, 2004) or negatively reduce the number of summer tourists and the amount of tourism revenue (Berrittella, Bigano, Roson, & Tol, 2006), the results of this study showed that warming of the weather in the summer has been associated with the migration of the elite and pensioners, reduction of working hours, and closing of markets. The consequence is the escalation of economic downturn and unemployment in the shrinking cities of Khuzestan province.

In relation to the linkage of climate and environmental changes with social factors, it emerged that these changes have escalated the number of illnesses and hospital referrals, school closures, and migration of specialised human resources in both education and health. Most previously done studies, such as Horrocks and Menclova (2011) and Ranson (2014), have pointed to a positive correlation between the change of temperature and criminal behaviour and violence in the shrinking cities. The present study, too, indicated that climate and environmental changes have resulted in a marked decline in the number of people in public places as well as an increase in depression and mental disorders. These problems, in turn, have intensified addiction, corruption, violence, and crimes. Overall, such social issues, attributed to climate and environmental changes, are considered important and independent factors for migrating from the shrinking cities. It was also identified that climate and environmental changes alongside some factors such as the war and the government's negligence have been effective in the lower physical and infrastructure quality of the region. Actually, these changes have been so effective that they have led to a disruption of electricity and water networks and, thus, disruption of life activities in the cities for hours. As a result, the life quality has declined, and a sense of insecurity is created.

The analysis of the relationships among the effective drivers and factors in out-migration from the shrinking cities of Khuzestan province can be summarized as shown in Fig. 4. As can be seen, the indirect impact of climate and environmental changes on the other migration drivers is more significant and complex than their direct impact. Also, as the figure indicates, political drivers bear a remarkable indirect

impact on the other factors especially economic and physical infrastructures.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.scs.2019.101480.

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